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Supporting Information for

Sublimation of Isolated Toric Focal Conic Domain on Micro-Patterned Surfaces

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Figures S1 to S8



Figure S1. Synthesis process of Ethyl 4'-[(5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,12,12-heptadecafluorododecyl)oxy][1,1'-biphenyl]-4-carboxylate (Y002)

All reactions were carried out under an inert gas atmosphere, and appropriate column chromatography was performed for purification after each reaction.

5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,12-heptadecafluoro-3-iodododecanoic acid (P1) was synthesized through a reaction between 3-Butenoic acid and heptadecafluoro-n-octyl iodide, catalyzed by tetrakis(triphenylphosphine)palladium. The reaction was conducted using hexane as a solvent at 0 °C for 6 hours. Afterward, the reaction was quenched with a sufficient amount of water, followed by filtration, drying, and purification.

Subsequently, 5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,12-heptadecafluoro-1-dodecanol (P2) was synthesized by reducing P1 using lithium aluminium hydride in THF as a solvent, and the reduction reaction was carried out for 4 hours. Due to the volatility of P2, it was able to be purified by separating transparent crystals obtained by sublimation at around 120 °C from the crude product. The prepared P2 underwent a reaction with carbon tetrabromide using a mixture of tetrahydrofuran and dichloromethane as a solvent. Triphenylphosphine was used as a catalyst, and the reaction was conducted at 0 °C for 8 hours. Any bromoform or TPP oxides present in the crude product were filtered under cold diethyl ether conditions for purification.

Synthesized 5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,12-heptadecafluoro-1-bromododecane (P3) underwent a 24-hour reaction with ethyl 3-(4-hydroxyphenyl) benzoate in the presence of potassium carbonate catalyst. This reaction took place in a dimethylformamide solvent at 65 °C, ultimately culminating in the final synthesis of Ethyl 4'-[(5,5,6,6,7,7,8,8,9,9,10,10,11,11,12,12,12-heptadecafluorododecyl)oxy][1,1'-biphenyl]-4-carboxylate (Y002). The synthesized compound was purified using several extractions with water and dichloromethane.



Figure S2. a) A detail schematic illustration of TFCD b) Scanning electron microscope and c) polarized optical microscope image of TFCD array (Scale bars=10 μ m)



Figure S3. SEM image of the sublimation process occurring on a flat glass substrate



Figure S4. SEM images of a) the TFCD structure of Y002 on flat Si substrate and the concentric circle pattern formed after sublimation, b) on a circular pillar and the concentric circle pattern formed after sublimation



Figure S5. Schematic images after sublimation of TFCD on a) a flat substrate and b) circular a pillar pattern. The green and pink colors each represent a topological equivalence.



Figure S6. SEM images of Y002 in transient state of sublimation process on elliptical pillar patterns



Figure S7. SEM image of naphthalene after sublimation process on circular pattern



Figure S8. Polarized microscope image of TFCDs confined in the microchannel of which depth and width are all 5 μ m, showing a linear arrangement of TFCDs.